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List of Figures and Tables

13Land and Soils

13.1 Introduction

This chapter describes the scope of works and methods applied in the identification and assessment of the potential effects of the construction and operation of the Glenamuck District Roads Scheme (GDRS) with regard to Land and Soils.

The assessment techniques used are aimed at identifying the likely significant impacts, proposing suitable mitigation measures if required and identify the residual impacts.

13.1.1 Impact Assessment - Scope of Works

The report will identifies and assesses the potential effects on the following:

- Existing bedrock geology
- Structural Geology;
- Superficial Geology;
- Extractive Industries;
- Geological Heritage Areas

To quantifiably assess the preceding, this chapter will:

- Outline relevant policy and legislation relating to the land and soils environment.
- Summarise consultation responses in relation to this assessment.
- Provide baseline information and identify sensitive receptors.
- Identify potential effects, including potential cumulative effects.
- Assess the significance of any adverse impacts and resulting effects based on the magnitude of the impact and the sensitivity of the receptors.
- Outline detailed mitigation measures where required.
- Provide a residual impact assessment.

13.1.2 European, National and Regional Policy

Key European and National legislative policy relevant to this assessment are contained within Table 13.1.

Table 13.1: Key Legislation

Policy	Legislation
EU	Water Framework Directive (2000/60/EC)
	Environmental Liability Directive (2004/35/EC)
National	Planning and Development Regulations 2001
	Planning and Development Act 2000

Further to the above legislation, various bodies including; Transport Infrastructure Ireland (TII, formally National Roads Authority); the Institute of Geologist Ireland (IGI); and the Environmental Protection Agency (EPA) provide detailed guidance to the preparation and content required for an EIAR in relation to the geological environment. In addition, other regional and leading supplementary industry guidance referred to as part of this assessment are as follows:

Table 13.2: Key Supplementary Guidance

Body	Guidance
Transport Infrastructure Ireland (TII)	Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA , 2009)
	Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2008)
	Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan
	The Management Of Waste From National Road Construction Projects
	Design of Earthworks Drainage, Network Drainage, Attenuation & Pollution Control (DN-DNG-03066)
Environmental Protection Agency (EPA)	Guidelines On The Information To Be Contained In Environmental Impact Assessment Reports (Draft August 2017)
	EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) Sept. 2003
	Geo Portal (https://gis.epa.ie/EPAMaps/)
CIRIA	The SUDS Manual (CIRIA C753)
	Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (CIRIA C532)
	Control of Water Pollution from Linear Construction Sites (CIRIA C648)
	Environmental Good Practice on Site (C692) (2010)
DLRCC	Dun Laoghaire and Rathdown County Council Planning (http://dlrcoco.ie/en/planning)
Institute of Geologists of Ireland (IGI)	Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements. (2013)
Dept of the Environment Heritage and Local Government	Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects
Department for Environment, Food and Rural Affairs (UK)	Construction Code of Practice for the Sustainable Use of Soils on Construction Sites

13.1.3 Local Planning

LAP objectives are set out in Chapter 6 of this EIAR.

13.2 Assessment Methodology

This assessment has been undertaken using a qualitative assessment based on experienced professional judgement and assessment of compliance with statutory and industry guidance, including a number of site visits.

13.2.1 Desktop Study

The desktop study involved collation and assessment of the relevant information from the following information sources.

- Consultation responses
- Vector mapping and aerial photography to assess land usage on the site and its environs
- Site surveys including topographic, underground utilities, orthophotography and site geotechnical investigations
- Utility & Local Authority infrastructure record drawings
- EPA Geo Portal (https://gis.epa.ie/EPAMaps/)
- Glenamuck District Distributor Road, Environmental Study (Vol 1-3), 2007, RPS;
- Glenamuck District Distributor Road, Preliminary Design Report, 2007, RPS;
- Glenamuck District Distributor Road, Feasibility Study & Route Selection Report, 2007, RPS;
- Glenamuck District Distributor Road, Constraints Study, 2007, RPS.
- Factual and Interpretive Reports. Site Investigation for Glenamuck District Roads Scheme, 2018, Priority Geotechnical.

13.2.2 Site Walkover Assessment

A number of site walkover surveys were undertaken from November 2017 to March 2018 with the purpose of identifying / verifying site characteristics.

The site walkover surveys encompassed the whole site area, with emphasis placed upon areas likely to be affected by proposed earthworks in order to fully assess potential issues with regards to lands and soil:

13.2.3 Scoring Matrix for Impact Assessment

Impact assessment has been carried out with reference to the EPA's "Guidelines On The Information To Be Contained In Environmental Impact Assessment Reports (Draft August 2017)" & the TII "Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes".

The significance of the identified potential impacts is acknowledged by the combination of the sensitivity of the receptor and the magnitude of the potential impact.

Receptor Sensitivity

- The sensitivity of the receiving environment has been categorised on a scale from "high" to "negligible" as defined in

Table 13.3. Sensitivity criteria has been based on:

- Vulnerability of a receptor to a particular pressure (degree of environmental response to any particular impact); and
- The 'value' of the receptor (e.g. an area of international importance should be considered more sensitive to the impact than an area of little or no conservation value.

Table 13.3: Receptor Sensitivity

Sensitivity of Environment	Criteria	Examples
High	Attribute has a high quality and rarity	Geological Feature rare on a regional of national scale (NHA) Large existing quarry / pit or landfill Active peat
Medium	Attribute has a medium quality and rarity	Geological Feature rare on a local scale (County Geological Site) Proven extractible resource rare on local level Well drained and Highly Fertile Soils
Low	Attribute has a low quality and rarity	Moderately drained and moderately fertile soils Small existing commercial quarry/pit/landfill
Negligible	Attribute resilient to environmental change	Poorly Drained and/or low fertility soils Common soils and bedrock

Impact Magnitude

The Impact Magnitude has been categorised on a scale from "high" to "negligible" as defined in Table 13.4.

Table 13.4 Impact Magnitude Criteria

Magnitude of Impact	Criteria	Examples (non-exhaustive)
High	Results in permanent loss of attribute	An impact that obliterates sensitive characteristics of the soil/geological feature
Medium	Results in temporary or minor impact to attribute and/or quality and integrity of attribute.	Impact on regional geological / soil characteristics
Low	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity.	Local impacts to geological / soil characteristics not affecting overall integrity of receptor
Negligible	An Impact without measurable or noticeable consequences or	No measurable impacts on ground conditions

Factors which influence the Impact magnitude include the type of impact and duration. These aspects are considered in line with TII and EPA guidance below

Table 13.5 Types of Impact

Potential Impact	Description
Direct Impact	The existing geological, hydrological or hydrogeological environment is altered in whole or in part as a consequence of road construction or operations
Indirect Impact	The existing geological, hydrological or hydrogeological environment beyond the proposed route corridors is altered by activities related to road construction and/or operation
No predicted impact	The proposed route corridor has neither a negative nor a positive impact on the geological, hydrological or hydrogeological environment

Table 13.6 – Impact Duration (EPA 2017)

Duration	Description
Momentary	Lasting from seconds to minutes
Brief	Effects lasting less than a day
Temporary	Effects lasting less than a year
Short-Term	Effects lasting one to seven years.
Medium Term	Lasting seven to fifteen years.
Long Term	Lasting fifteen to sixty years.
Permanent	Lasting over sixty years
Reversible	Impacts that can be undone, for example through remediation or restoration

Impact Significance

The significance of the identified potential impacts is acknowledged by the combination of the magnitude of the potential impact (Table 13.4) and sensitivity of the receptor (

Table 13.3). The generalised significance terms used in this assessment is in line with the EPA guidance reproduced in Figure 13-1 below

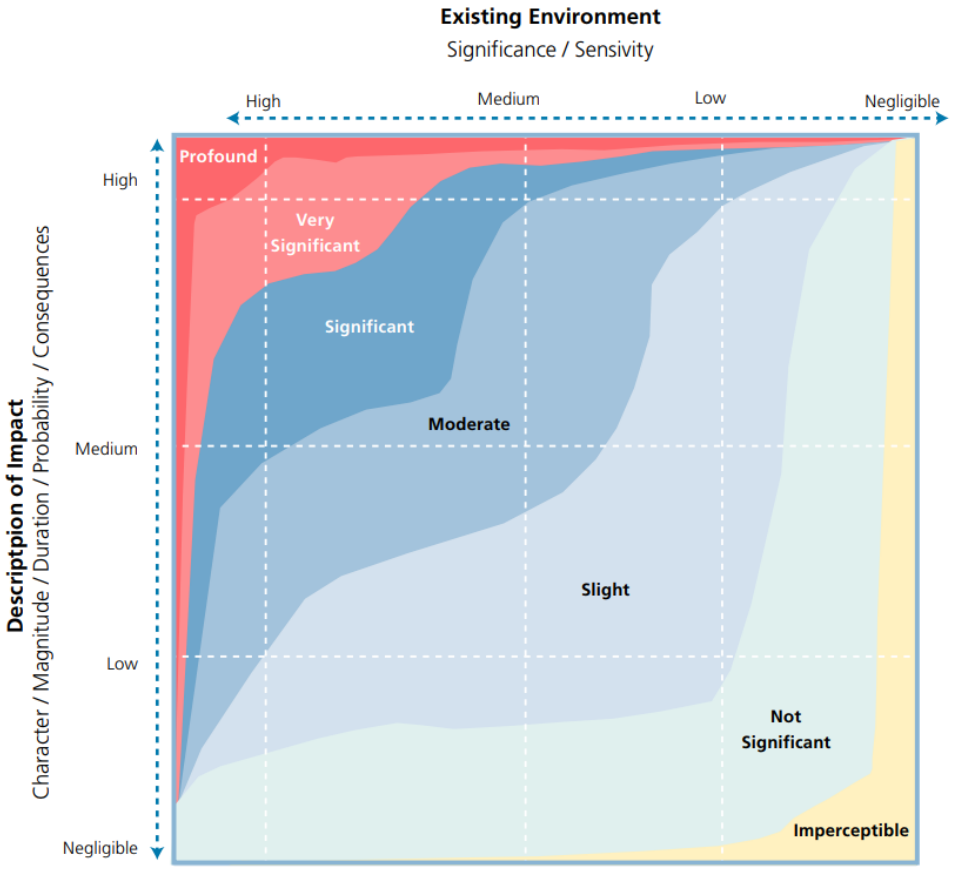

Figure 13.1: Significance Effect Matrix

In addition to significance, the effect on the receiving environment may be Positive, Neutral or Adverse.

13.3 Baseline Environment

13.3.1 Bedrock Geology

The 1:100,000 GSI bedrock Geology Map (Sheet 16) indicates that the Glenamuck District Roads Scheme (GDRS) is underlain in its entirety by Granite Bedrock. The bedrock is described in geological mapping as a Caledonian Age Granite and is part of a formation known as the Northern and Upper Liffey Valley Plutons. This formation is present from the Blessington Lakes area in Wicklow to the coast at Dun Laoghaire. The rock description is a granite with muscovite phenocrysts. The rock classification within the site extents is a Type 3 muscovite porphyritic. An extract from GSI mapping is presented in Figure 13.2

In general the rock encountered during the ground investigation is consistent with the published geology for the area. 7 boreholes were installed across the site to a maximum depth of 8.0m. No bedrock was encountered in 3 of the boreholes and it was encountered, at depth ranging from 2.8m - 4.8m in the remainder. Where encountered, rock was described as a strong white granite with some fracturing.

A number of bedrock outcrops in the vicinity of the site were noted on geological mapping and during site walkovers.

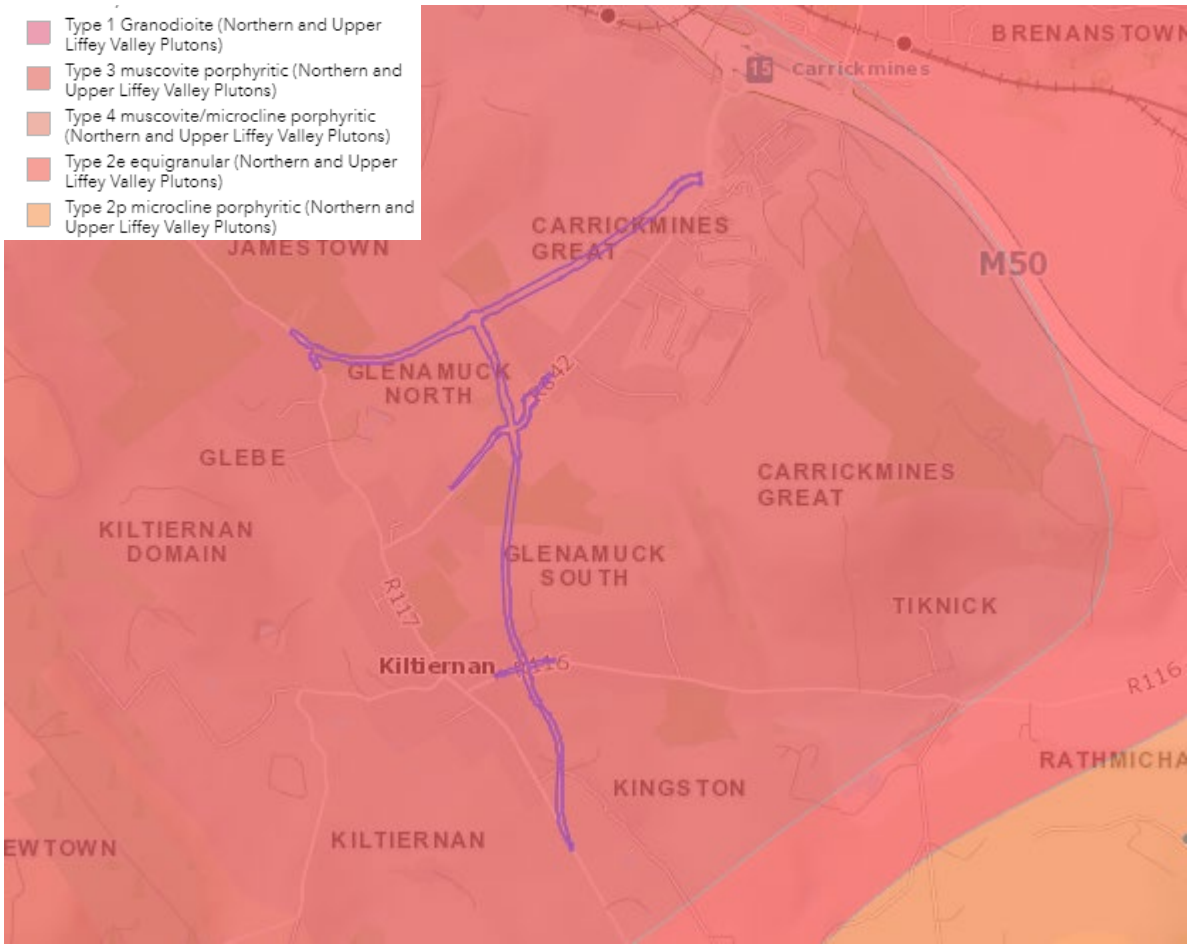

Figure 13.2: Bedrock Geology

13.3.2 Superficial Geology (Soils)

The subsoils underlying the road route are comprised of variable sediments and thickness of Quaternary aged Glacial Till (boulder clay). GSI Quaternary sediment mapping indicates the route to be underlain by tills of either limestone of granite origin along with isolated areas of exposed bedrock.

Site investigation was generally in accordance with geological mapping. Typically soil stratas encountered were topsoil (0.2m-0.5m) underlain by subsoils (2.0m-8.0m+). The majority of classifications were as a sandy gravelly clay. There was a degree of variability in the classifications across the site with some areas classified as clayey sands, clayey gravels or clayey silts. Cobbles and boulders up to 500mm diameter were commonly encountered in trial pits.

Infiltration testing in accordance with BRE digest 365 methodologies was carried out as part of site investigations. Most areas on site did not exhibit measurable infiltration rates indicating that the ground may be prone to waterlogging. It is however noted that testing was carried out in Spring 2018 which followed an unusually wet and cold winter which had led to widespread ground saturation across the country.

A small area of made ground is present within the road scheme footprint. This is in an area owned by DLRCC where recent construction works have taken place to provide traveller accommodation. Site investigations within the made ground indicate that this is primarily soil however some construction rubble is also present

Figure 13.3: Quaternary Sediments

13.3.3 Contaminated Ground

No existing areas of contaminated ground have been identified within the road route. During site investigation environmental testing was carried out on samples from all trial pits. No asbestos was detected in any locations. Samples from all trial pits indicate that soils would be classed as inert under the EPA Waste acceptance Criteria. Within slit trenches in existing roads, two locations recorded levels marginally above Waste Acceptance criteria recommended values for Inert Waste (but below the threshold for hazardous waste).

13.3.4 Unstable Ground & Geohazards

The GSI holds a database of historical landslides in Ireland. No records in this database lie in the vicintiy of the roads scheme

The underlying bedrock is granite which is not a soluble rock and therefore no Karst features are anticipated or recorded in the area.

There is no evidence in mapping or site investigation of significant peat deposits in the area.

13.3.5 Waste Facilities

The EPA holds database of waste facilities. The only waste facility in the vicinity of the site is Ballyogan Landfill / Ballyogan Recycling Park. Ballyogan landfill is situated to the north of Golf Stream to the north

of the proposed scheme extents. No portion of the scheme is within the landfill footprint and there are no works proposed within the landfill area

13.3.6 Quarries / Mines

There are no Quarries or mines affected by the proposed roads scheme. A small sand pit is shown on historical mapping adjacent to the Glenamuck stream within the road route however no surface features of the pit remain. The historic Ballycorus leadmines are outside the scheme extents and are unaffected by proposed works

13.3.7 Geological Heritage Sites

The GSI hold a database of Geological Heritage Sites. No heritage sites are within the proposed road scheme extents. The closest identified site is Ballycorus Leadmines which is located outside the scheme extents

13.3.8 Designated sites

Table 13.7 below details designated sites within 5km of the proposed scheme.

Table 13.7: Designated Sites

Station ID	Name	Designation	Distance	Commentary
001207	Dingle Glen	Proposed NHA	0.6 km	Dry valley formed by a glacial lake overflow channel. Proposed designation based on variety of habitats within a small area. Not within scheme extents or sensitive to soils/geological impacts at the site.
001202	Ballybetagh Bog	Proposed NHA	1.3 km	Fen area with proposed designation based primary based on fossil remains. Not within scheme extents or sensitive to soils/geological impacts at the site.
000725	Knocksink Wood	Proposed NHA, SAC	4.6 km	Designation based on petrifying Spring and Alluvial Forest habitat. Located within separate hydrological catchment to the scheme. Not within scheme extents or sensitive to soils/geological impacts at the site.
000713	Ballyman Glen	Proposed NHA, SAC	2.8 km	Designation based on petrifying Spring and Alkaline Fen habitat. Not within scheme extents or sensitive to soils/geological impacts at the site.
001211	Loughlinstown Woods	Proposed NHA	3.0 km	Proposed designation based on mixed woodland species and habitat of natural character. Site primarily used for amenity purposes. Not within scheme extents or sensitive to soils/geological impacts at the site.

001768	Powerscourt Woodland	Proposed NHA	4.3km	Proposed designation based on mixed woodland species and habitat. Not within scheme extents or sensitive to soils/geological impacts at the site.
001206	Dalkey Coastal Zone And Killiney Hill	Proposed NHA	4.4 km	Coastal site spanning from Dun Laoghaire Harbour to Shankhill. Proposed designation based on varied habitats from sub-littoral to coastal heath. Also supports variety of bird and crustation species and contains rock exposures of geological interest. Not within scheme extents or sensitive to soils/geological impacts at the site.

Based on the above review no designated sites are considered to be sensitive to soils/geological impacts at the subject site.

13.3.9 Baseline Summary and Sensitivities

The baseline assessment indicates a number of land & soils receptors that have the potential to demonstrate sensitivity to the development proposed at the site. These are:

- Soils/Subsoils ;
- Bedrock

Sensitivity of the receptors identified is determined in accordance with the rationale described in 'Determination of Magnitude and Significance Criteria'.

Table 13.8 Baseline Summary

Type	Receptor	Sensitivity	Rationale
Geological	Granite Bedrock	Negligible	Common bedrock formation which underlies over 400km^2 of Dublin. Resilient to significant change without effect to the overall receptor value
Geological	Soils / Subsoils	Low	Moderate Fertility moderately drained soils. Common soil type across Ireland

13.4 Predicted Impacts

13.4.1 Construction Phase

The construction phase impacts are those associated with the significant excavations, soil movement, aggregate import and construction plant usage. Reference should be made to Chapter 5 "Description of Scheme" where the construction activities have been outlined in detail. The lists below represent the likely potential impacts in the absence of mitigation. Mitigation measures to reduce the impact are discussed in Section 13.5. Construction activities can pose a significant risk to the watercourse receptors identified. The main impacts arising from construction activities are listed in Table 13.9:

It is noted that there is interaction and interrelationships with land and soils impacts discussed in other chapters of this assessment

Table 13.9: Predicted Impacts - Construction Phase

Impact	Source	Consequence
Chemical Pollution of geological receptors	• Temporary presence of chemicals, fuels, and other oils associated with construction activities on the site have potential to enter subsurface environment through accidental spillages, improper transport and refuelling, or inappropriate storage and disposal procedures, by gradual leakage or single failure of storage tanks or refuelling mechanism.	• Contamination of soils may result in the requirement for extensive remediation or offsite disposal of contaminated materials • Contamination of soils may create pathways for contaminants to affect other environmental receptors
Loss of soil value	• Temporary construction activities would require excavations, ground disturbance, stripping of soils, and temporary spoil deposition. Exposed soils have potential to be eroded by wind and water • Soil may be compacted degraded by constructions works • Construction dewatering may affect slope stability	• Loss of soils value and potentially affecting air or water receptors • Construction works may affect soils value and suitability for future use
Material generation	• Excessive excavations or material import may occur • Poor soil handing may result in mixing of higher value soils types such .as topsoil or gravels with lower value material	• Poor soil handing may prevent reuse of materials within the scheme. • Excessive material import/export may affect complementary assessments such as traffic or waste receptors

13.4.2 Unmitigated Significance -Construction Phase

Magnitudes of identified impacts, and associated unmitigated significance of those impacts, are determined in accordance with the rationale previously described and are presented in the following table.

Mitigated significance is presented in Table 13.14

Table 13.10: Unmitigated Significance - Construction Phase

Receptor	Receptor Sensitivity	Potential Impact	Impact Magnitude	Impact Significance (pre mitigation)
Soils/Subsoils	Low	Chemical Pollution of geological receptors	Low – Potential for local impacts to soil value and distribution	Slight
Granite Bedrock	Negligible	Chemical Pollution of geological receptors	Low – Potential for local impacts to rock value and distribution	Not Significant
Soils/Subsoils	Low	Loss of soil value	Low – Potential for local impacts to soil value and distribution	Slight
Soils/Subsoils	Low	Material Generation	Low – Potential for local impacts to soil value and distribution	Slight
Granite Bedrock	Negligible	Material Generation	Low – Potential for local impacts to rock value and distribution. Extent of works to extending to bedrock layers anticipated to be minor	Not Significant

13.4.3 Operational Phase

The operational impacts are those associated with the completed road including final surface treatments, conveyance of traffic flows and all operation and maintenance activities of the road and associated works. The main impacts arising from construction activities include:

Table 13.11: Predicted Impact - Operational Phase

Impact	Source	Consequence
Loss of soil value	• Any exposed soils or those which remain unplanted and have potential to be eroded by wind and water • Potential of soil slippage or settlement on poorly constructed or damaged slopes/retaining walls	• Loss of soils value and potentially affecting air or water receptors • Unmitigated impacts may affect soils value and suitability for future use

13.4.4 Unmitigated Significance -Operation Phase

Magnitudes of identified impacts, and associated unmitigated significance of those impacts, are determined in accordance with the rationale previously described and are presented in the following table.

Mitigated significance is presented in Table 13.14.

Table 13.12: Unmitigated Significance - Operation Phase

Receptor	Receptor Sensitivity	Potential Impact	Impact Magnitude	Impact Significance (pre mitigation)
Soils/Subsoils	Low	Loss of soil value	Low – Potential for local impacts to soil value and distribution	Slight

13.5 Mitigation Measures

13.5.1 Mitigation Measures – Preamble

From the assessment of potential impacts during construction & operation, the following key issues have demonstrated potential impact significance and so require particular attention for mitigation and management:

- Chemical Pollution of Geological Receptors
- Loss of Soil Value
- Material Generation

The greatest risk to the environment is during the construction period, coinciding with the greatest amount of activity on site. In addition, effects unmitigated during construction have the potential to extend into the operational phase.

13.5.2 Mitigation Through Design

The site layout has evolved in order that the design minimizes impact on the land and soil environment. Design evolution to minimise environmental impact has been prioritised throughout the various design stages. This is detailed in the Environmental Report which supported the LAP road route selection and has been continued throughout the planning stage design.

The vertical and horizontal alignment of the road has been optimized to minimize cut and fill requirements and seek to obtain a balance of cut and fill materials (within constraints of road design criteria and landscape considerations).

Sufficient space has been provided within the works area for segregated spoil storage.

Preconstruction soils testing has been carried out to determine if any contamination exists

13.5.3 Mitigation Through Procedures

In order to facilitate the integration of environmental issues into road scheme planning, construction and operation, an Environmental Operating Plan (EOP) shall be produced, implemented and maintained by the contractor. This represents a best practice guide for considering the environment for the construction life cycle of a national road scheme project.

The EOP shall be designed to assist the main contractor in preventing, managing and/or minimising significant environmental impacts during the construction phase. To achieve this objective the EOP shall:

- Comprehensively incorporate all Environmental Commitments set out in the Contract documents, Planning Documents (including EIAR), any conditions and/or modifications imposed by An Bord Pleanála or the local authority
- Provide a method of documenting compliance with these Environmental Commitments and conditions/modifications;

- Itemise relevant environmental legislative requirements and best practice guidance. The EOP should also provide a method of documenting compliance with these requirements, and
- Outline methods by which construction work will be managed to prevent, reduce or compensate for potential adverse impacts on the environment
- Incorporate procedures for communicating with the public, statutory consultees, local authority and relevant site-personnel;
- Incorporate procedures for Environmental Awareness Training for the main contractor's staff;
- Incorporate monitoring procedures and responses to monitoring results, where contractually required, and
- Provide for a system of audit with regard to the effectiveness of the EOP during the construction life cycle of the project.
- Include an Emergency Response Plan (ERP) detailing the procedures to be undertaken in the event of a spillage of chemical, fuel or hazardous wastes, fires or flood events.

TII have published "Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan" which should be used as a basis for the creation of the EOP.

The EOP shall be co-ordinated with all other environmental procedural documents required which may include a Construction Management Plan, Construction And Demolition Waste Management Plan and a Pollution Prevention Plan.

13.5.4 Specific Mitigation Measures – Chemical Pollution

- Foul Drainage from all site offices and facilities will be contained and disposed of in an appropriate matter to prevent pollution in accordance with the relevant statutory bodies.
- Refuelling of construction machinery shall be undertaken in designated areas located away from surface water drainage in order to minimise potential contamination impacts. Spill kits shall be kept in these areas in the event of spillages.
- Oil and fuel stored on site for construction should be stored in designated areas. These areas shall be bunded (to min 110% of chemical volume).
- Pouring of concrete including wash down and washout of concrete from delivery vehicles to be controlled in an appropriate facility to prevent contamination
- Regular samples to be taken from soils affected by earthworks which shall be analysed for contamination

13.5.5 Specific Mitigation Measures – Loss of Soil Value

- Vegetation should be established as soon as possible on all exposed soils
- Due consideration will be given to the prevailing ground and weather conditions when programming the execution of the works.
- Suds features to be in place prior to the main construction works. Suds features to be designed to limit soil erosion
- Construction machinery shall minimise tracking over soils to minimise compaction
- Exposed soil should be covered or seeded as soon as possible
- Topsoil should be stripped and stockpiled separately for reuse and landscaping material
- All disturbed areas to be reinstated with suitable soils to ensure future growth. All verges and boulevard areas to have sufficient topsoil depths

13.5.6 Specific Mitigation Measures – Material Generation

A significant earthworks element is inevitable for new road construction to achieve the required geometry and foundation conditions. A preliminary indication of material quantities associated with the proposed scheme is presented in Table 13.13. It is noted that these volumes are based on preliminary design and will be further refined and optimized through a future detailed design process.

Table 13.13: Preliminary Material Volumes

Description	Quantity
Excavation for Roads	57,500 m^3
Excavation for Ponds	51,600 m^3
Re-use of Excavated material in Road construction	39,500 m^3
Surplus Soils Volume	69,600 m^3
Imported Road Gravels	30,100 m^3
Imported Concrete & Asphalt Surfacing	11,000 m^3

Many of the measures outlined in Sections 13.5.2 - 13.5.5 are relevant to material generation. Additional measures to be implemented to reduce the impact of material generation include

- Areas of stripped soils to be minimised to those required for the project earthworks
- All soil handing to be in line with best practice guidance and in line with mitigation measures to protect the water environment
- Excavated soils to be adequately separated to maximise reuse as embankment material, landscape fill or road construction material
- Imported materials to be suitably separated to avoid contamination or mixing

- The use of soil screening on or other treatments should be used on site where it is possible to process materials which would otherwise be classified as unacceptable into materials suitable for use in the project.
- For imported materials, the use of local quarries or locally available material should be prioritised.
- All materials exported from site to be in accordance with the Waste Management Acts.
- Any potential for use of surplus material within local sites shall be pursued at construction and detailed design stage (subject to compliance with Waste Management Acts). If any material is to be reused on another site as a by-product (and not a waste), this will be done in accordance with Article 27 of the Waste Directive Regulations.

13.5.7 Mitigated Significance

Magnitudes of identified impacts, and associated significance of those impacts following adoption of the preceding mitigation have been determined. This assessment is in accordance with the rationale previously described is presented in the following table.

Table 13.14: Mitigated Significance

Receptor	Receptor Sensitivity	Potential Impact	Impact Magnitude	Impact Significance (post mitigation)
Soils/Subsoils	Low	Chemical Pollution of geological receptors	Low / Negligible: Implementation of best practice measures to control hazardous substances mitigates impact. Measures include controls on use and storage of hazardous materials, controls on construction works.	Not Significant
Granite Bedrock	Negligible	Chemical Pollution of geological receptors	Low / Negligible: Implementation of best practice measures to control hazardous substances mitigates impact. Measures include controls on use and storage of hazardous materials, controls on construction works.	Not Significant
Soils/Subsoils	Low	Loss of soil value	Low / Negligible: Implementation of best practice measures for to protect soil value mitigates impact. Measures include best practice soil handling and construction practices and reinstatement of affected areas.	Not Significant
Soils/Subsoils	Low	Material Generation	Low / Negligible: Implementation of best practice measures for material generation mitigates impact. Measures include optimisation of	Not Significant

			road geometry, reuse of materials and use of local quarrys/waste receivers.	
Granite Bedrock	Negligible	Material Generation	Low / Negligible: Implementation of best practice measures for material generation mitigates impact. Measures include optimisation of road geometry, reuse of materials and use of local quarrys/waste receivers.	Not Significant

Post mitigation impact significance for all identified impacts has been determined as Not Significant.

13.6 Residual Impacts

As a consequence of compliance with the construction and operation mitigation there will be not be a significant residual impact on the identified land and soil receptors

13.7 Difficulties Encountered

No significant difficulties were encountered during the assessment.

13.8 References

- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA, 2009);
- Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2008);
- Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan (TII);
- The Management Of Waste From National Road Construction Projects (TII);
- Design of Earthworks Drainage, Network Drainage, Attenuation & Pollution Control (DN-DNG-03066) (TII);
- Guidelines On The Information To Be Contained In Environmental Impact Assessment Reports (Draft August 2017) (EPA);
- EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) Sept. 2003;
- Geo Portal (https://gis.epa.ie/EPAMaps/) (EPA);
- The SUDS Manual (CIRIA C753) (CIRIA);
- Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (CIRIA C532);
- Control of Water Pollution from Linear Construction Sites (CIRIA C648);
- Environmental Good Practice on Site (C692) (2010) (CIRIA);
- Dun Laoghaire and Rathdown County Council Planning (http://dlrcoco.ie/en/planning);
- Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements. (2013) Institute of Geologists of Ireland (IGI);
- Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects, Dept of the Environment Heritage and Local Government;
- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, Department for Environment, Food and Rural Affairs (UK); and
- Geological Survey Ireland Spatial Resources https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 .